

Magnoliophyta Seed (Species) Diversity in Riparian Soils along the Olentangy River at ORWRP

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Introduction

In connection with an education class project to develop a seed/seed germination study for an elementary school class the second author wanted to participate in an undergraduate research project studying the species diversity in a natural seed bank. To that end it was decided to collect soil samples from the bottomland hardwood forest floodplain at ORWRP and determine seed germination under greenhouse conditions. The study was conducted in winter and early spring of 2001.

Methods

Soil samples were collected in late December, 2000 from six locations at ORWRP, five from within the bottomland hardwood area and one from a weedy area just to the southwest of the tree line (Figure 1). Samples were collected by scraping off surface weeds and litter with a nurseryman's digging spade and removing a block of soil 0.3 m^2 to a depth of $\pm 8 \text{ cm}$ with the same tool. Then the sides of each hole were compacted to prevent cave-in and a second $\pm 8 \text{ cm}$ soil sample was removed from each site. In other words, from

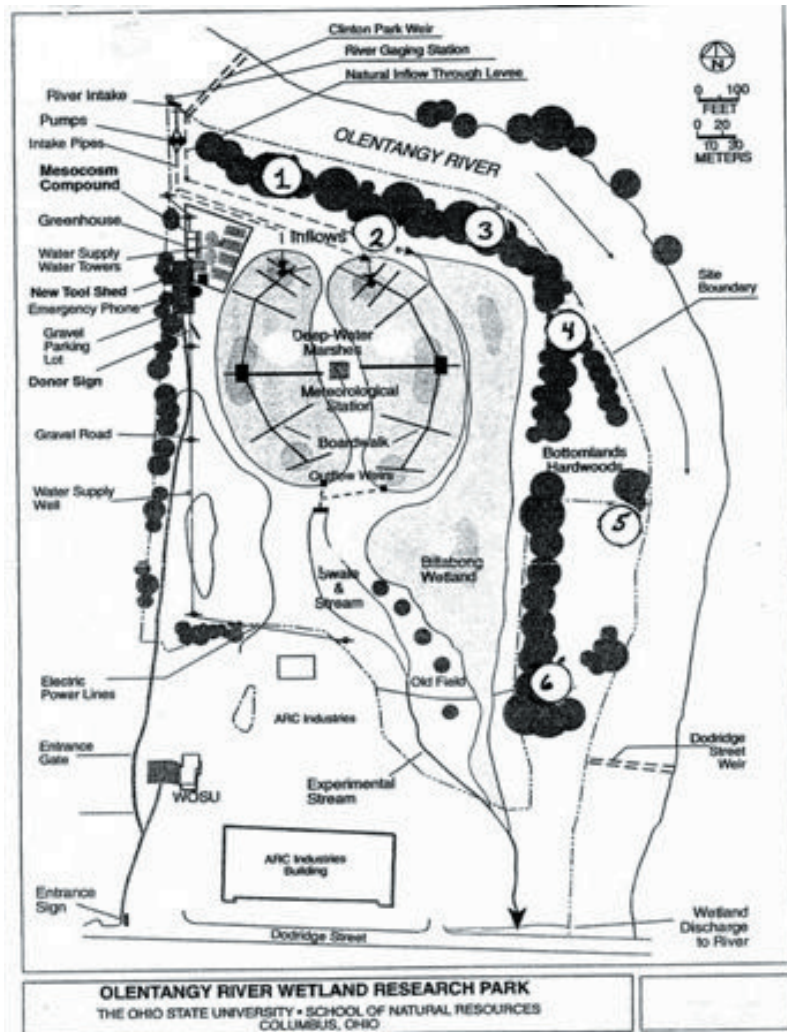


Figure 1: The study site at the Olentangy River Wetland Research Park

each site both an upper (surface) sample was taken as well as a deeper one. Each sample was plastic-bagged, brought to Shawnee State University and held in a refrigerator until early January, 2001.

Each sample was spread out in a large tray to facilitate removal of roots, grubs, stones and other debris. The soil was then spread evenly in a plastic greenhouse flat with drainage holes and marked with place of origin. Soil depth in the flats was about 5 cm. Flats were placed in a greenhouse that was held at an average temperature of 24° C daytime, 12° C night. Flats were watered as the soil surface approached visible dryness; generally this resulted in once-a-day watering.

Flats were checked for germinating seedlings twice a week for ten weeks. Identification of seedlings were made based on existing knowledge of the senior author and Anonymous (1960, 1994), Shopmeyer (1974), Uva et

al. (1997), and Young and Young (1992). Identifications were made as soon as possible; for a few, identifications could be made in the cotyledon stage but for most the plant had to produce primary or secondary leaves. Once a plant was tentatively identified it was marked by placing a color coded plastic toothpick beside it.

Results and Discussion

Not surprisingly, far more seedlings ($n = 123$) appeared in the upper (surface) soil samples than from the lower layer of soil ($n = 20$). Also not surprising was the fact that the soil sample from the weedy area, marked Site 2 (Table 1), produced more than twice as many seedlings as any of the sites from the wooded area. One would expect this result possibly because of the greater diversity of plants covering the area than was true of the wooded area sites

Table 1. Species germinating in bottomland surface soils from a depth of 0 – 8 cm. Soil samples from Olentangy River Wetland Research Park; soils held under normal greenhouse conditions for ten weeks beginning early January, 2001.

Site 1: Wooded. Approximately 50 m east of Clinton Park Weir

Seedlings:	Latin binomial:	Common Name:	#
5	<i>Alliaria officinalis</i> Andr.	Garlic Mustard	
1	<i>Urtica</i> sp. (possibly <i>dioica</i>)	Stinging Nettle	
2	Unidentified Dicots		

Site 2: Weedy area just north of Inlet, Wetland 2

# Seedlings:	Latin binomial:	Common Name:
13	<i>Boehmeria cylindrica</i> (L.) Sw.	False Nettle
3	<i>Aster</i> sp.	Wild Aster
2	<i>Urtica</i> sp. (possibly <i>dioica</i>)	Stinging Nettle
2	<i>Rhus</i> (<i>Toxicodendron</i>) <i>radicans</i> L.	Poison Ivy
2	<i>Daucus carota</i> L.	Wild Carrot, Queen Anne's Lace
1	<i>Asarum canadense</i> L.	Wild Ginger
1	<i>Geum</i> sp. (possibly <i>canadense</i>)	White Avens
1	<i>Setaria</i> sp.	Foxtail
8	Unidentified Grasses (<i>Poaceae</i>)	
15	Unidentified Dicots	

Site 3: Wooded. Approximately 40 m northeast of Inlet, Wetland 2

# Seedlings:	Latin binomial:	Common Name:
7	<i>Aster</i> sp.	Wild Aster
6	Unidentified Dicots	

where so much of the understory consisted of dense stands of *Lonicera macckii* (Rupr.) Herder (Amur Honeysuckle). Table 2 lists the plants that were identified from the lower layer of soil taken from each site.

It should be understood that a study such as this cannot identify all species represented by viable seeds in the soil. First, we could not follow all of the plants to maturity, which would have been necessary to identify to species some of the plants here identified only to Genus or indicated in Tables 1 and 2 as 'Unidentified'. Second, some seeds (species) would not have completed necessary cold chilling or have undergone required physiological preparation for germination from the time of seed maturation and release in the fall of 2000. Third, the greenhouse conditions under which this study was conducted would, in all likelihood,

not have been suitable for some species with seeds present in the soil samples; this may have been true especially for certain woody species.

References

- Anonymous. 1994. Weed I.D. Guide. Published by Zeneca Ag Products. Publication # 04-0627-049-R2.
- Anonymous. 1960. Weeds of the North Central States. University of Illinois, Agricultural Experiment Station, Circular 718. North Central Regional Publication No. 36.
- Martin, Alexander C. 1972. A Golden Guide to Weeds. Western Publishing Co./Golden Press. New York.

Table 1. continued

Site 4: Wooded. Approximately 60 m northeast of mid-basin, Wetland 2

# Seedlings:	Latin Name:	Common Name:
4	<i>Boehmeria cylindrica</i> (L.) Sw.	False Nettle
3	<i>Physalis subglabrata</i> Mack. & Bush	Smooth Ground Cherry
2	<i>Alliaria officinalis</i> Andr.	Garlic Mustard
2	<i>Chenopodium album</i> L.	Lamb's Quarter
2	<i>Aster</i> sp.	Wild Aster
1	<i>Asarum canadense</i> L.	Wild Ginge
1	<i>Plantago major</i> L.	Great Plantain
1	Unidentified Sedge (<i>Cyperaceae</i>)	
5	Unidentified Dicots	

Site 5: Wooded. Approximately 80 m east of Outlet, Wetland 2

# Seedlings:	Latin Name:	Common Name:
2	<i>Asarum canadense</i> L.	Wild Ginger
2	<i>Physalis subglabrata</i> Mack & Bush	Smooth Ground Cherry
1	<i>Aster</i> sp.	Wild Aster
1	<i>Conyza canadensis</i> (L.) Cronq.	Common Horseweed
14	Unidentified Dicots	

Site 6: Wooded. Approximately 50 m northwest of Dodridge Street Weir

# Seedlings:	Latin Name:	Common Name:
3	<i>Viola</i> sp. (possibly <i>papilionacea</i>)	Wild Violet
2	<i>Aster</i> sp.	Wild Aster
1	<i>Cardamine pensylvanica</i> Muhl.	Pennsylvania Bittercress
1	<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia Creeper
1	<i>Glechoma hederacea</i> L.	Ground-ivy
1	<i>Daucus carota</i> L.	Wild Carrot, Queen Anne's Lace
4	Unidentified Dicots	

Shopmeyer, C.S. 1974. Seeds of Woody Plants in the United States. U.S. Forest Service, Agriculture Handbook No. 450. U. S. Dept. of Agriculture, Washington, D.C.

Uva, Richard H., Joseph C. Neal, & Joseph M. DiTomaso. 1997. Weeds of the Northeast. Comstock Publishing Associates, A Div. of Cornell University Press. Ithaca.

Young, James A. & Cheryl G. Young. 1992. Seeds of Woody Plants in North America. Dioscorides Press. Portland, OR.

Table 2. Species germinating in bottomland soils from a depth of 8 – 16 cm beneath the surface at ORWRP.

Site 1: Wooded. Approximately 50 m east of Clinton Park Weir

# Seedlings	Latin Name:	Common Name:
2	Unidentified Dicots	

Site 2: Weedy area just north of Inlet, Wetland 2

1	<i>Convolvulus</i> sp.	Bindweed
1	<i>Boehmeria cylindrical</i> (L.) Sw.	False Nettle
2	Unidentified Dicots	

Site 3: Wooded. Approximately 40 m northwest of Inlet, Wetland 2

1	<i>Asarum canadense</i> L.	Wild Ginger
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Site 4: Wooded. Approximately 60 m northeast of mid-basin, Wetland 2

1	<i>Oxalis stricta</i> or <i>europaea</i>	Yellow Wood Sorrel
1	<i>Aster</i> sp. or <i>Solidago</i> sp.	Wild Aster or Goldenrod

Site 5: Wooded. Approximately 80 m east of Outlet, Wetland 2

1	<i>Daucus carota</i> L.	Wild Carrot, Queen Anne's Lace
1	<i>Panicum</i> sp.	Panic Grass
3	Unidentified Dicots	

Site 6: Wooded. Approximately 50 m northwest of Dodridge Street Weir

5	<i>Alliaria officinalis</i> Andrz.	Garlic Mustard
1	Unidentified Dicot	